

AMENDMENTS TO CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously Presented) A high speed search method in a speech encoder using an order character of LSP (Line Spectrum Pair) parameters in an LSP parameter quantizer using SVQ (Split Vector Quantization) used in a low-speed transmission speech encoder, the high-speed search method comprising the steps of:

rearranging a first codebook by replacing the first codebook with a new codebook in which a number of code vectors in the new codebook are arranged in an order according to an element value of a reference row of the first codebook for determining a range of code vectors to be searched; and

determining a search range by using an order character between a given target vector and an arranged code vector to obtain an optimal code vector,

wherein the rearranging step comprises the steps of:

selecting the reference row in the first codebook by using a plurality of voice data, and then determining an optimal arrangement position (N_m) in which an average search range is minimized; and

replacing the first codebook with the new codebook in which a number (L_m) of code vectors in the new codebook are arranged in a descending order according to the element value of a selected said reference row.

2. (Canceled)

3. (Currently Amended) A high-speed search method in a speech encoder using an order character of LSP (Line Spectrum Pair) parameters in an LSP parameter quantizer using SVQ

(Split Vector Quantization) used in a low-speed transmission speech encoder, the high-speed search method comprising the steps of:

rearranging a first codebook by replacing the first codebook with a new codebook in which a number of code vectors in the new codebook are arranged in an order according to an element value of a reference row of the first codebook for determining a range of code vectors to be searched; and

determining a search range by using an order character between a given target vector and an arranged code vector to obtain an optimal code vector,

wherein obtaining an optimal code vector comprises the steps of:

determining the search range by forward and backward comparison of the element value of the reference row in the first codebook and element values of positions before and after a reference position in the target vector; and

obtaining an error criterion ($E_{l,m}$) having high computational complexity by using the following equation only within the determined search range:

$$[[E_{l,m} = (\mathbf{p}_m - \mathbf{p}_{l,m})^T \mathbf{W}_m (\mathbf{p}_m - \mathbf{p}_{l,m})]] \quad \underline{E_{l,m} = (\mathbf{p}_m - \mathbf{p}_{l,m})^T \mathbf{W}_m (\mathbf{p}_m - \mathbf{p}_{l,m})}$$

$$0 \leq m \leq M - 1$$

$$1 \leq l \leq L_m$$

where \mathbf{p} is an LSP code vector divided into M sub-vectors, each of which consists of L_m code vectors,

where \mathbf{p}_m is a target vector to search the m^{th} codebook, and $\mathbf{p}_{l,m}$ corresponds to an l^{th} code vector in a codebook for an m^{th} sub-vector,

where l, m in the subscript of $E_{l,m}$ are indices that represent the l th index of the m th codebook, *i.e.*, the letters “ l ” and “ m ,” and

where superscript T designates the transpose of $[(\mathbf{p}_m - \mathbf{p}_{l,m})]$ $(\mathbf{p}_m - \mathbf{p}_{l,m})$ for purposes of determining the dot product of $[(\mathbf{p}_m - \mathbf{p}_{l,m})]$ and $\mathbf{W}_m (\mathbf{p}_m - \mathbf{p}_{l,m})]$ $(\mathbf{p}_m - \mathbf{p}_{l,m})$ and $\mathbf{W}_m (\mathbf{p}_m - \mathbf{p}_{l,m})$ in order to calculate the least-mean-square error $E_{l,m}$, and where \mathbf{W}_m is a weighting matrix for the m^{th} sub-vector and obtained by a non-quantized LSP code vector \mathbf{p} .

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4. (Previously Presented) The high-speed search method as claimed in claim 3,
wherein the search range is an average number with which an element value of the n^{th} row
in the first codebook and element values in the $n+1^{\text{th}}$ and $n-1^{\text{th}}$ positions of the target vector
satisfy the order character.

5. (Canceled)

6. (Canceled)

7. (Canceled)

8. (Canceled)